

Tsukuba 32-m VLBI Station

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Abstract

The Tsukuba 32-m VLBI station is operated by the Geographical Survey Institute (GSI) VLBI group. This report summarizes the current status and the future plans of the Tsukuba 32-m VLBI station.

In 2009 we participated in a total of 209 domestic and international VLBI sessions in accordance with the IVS Master Schedule. The IYA2009 special session in November was the noteworthy event. In addition, several ultra-rapid dUT1 experiments were conducted this year.

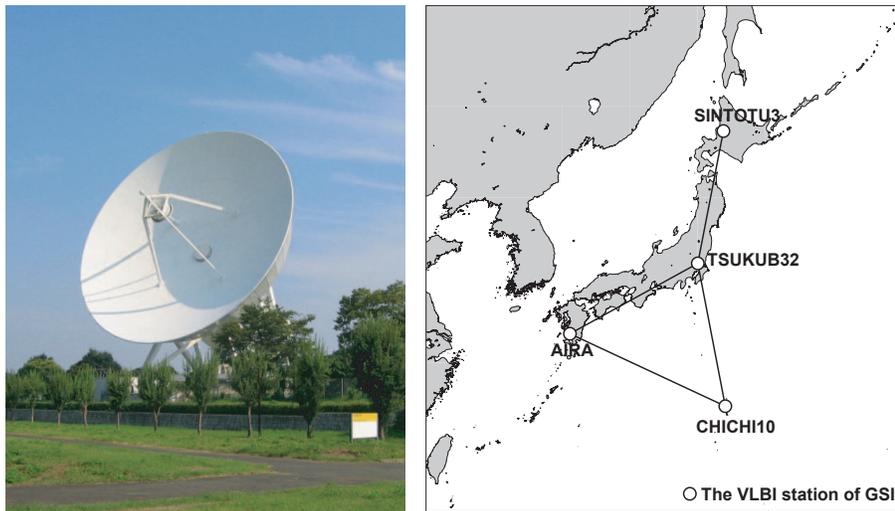


Figure 1. Tsukuba 32-m VLBI station and GARNET (GSI VLBI network).

1. General Information

The Tsukuba 32-m VLBI station (TSUKUB32) is located at GSI in Tsukuba Science City which is about 50 km to the northeast of the capital Tokyo.

GSI has three regional stations besides TSUKUB32: SINTOTU3, CHICHI10, and AIRA. All four stations form our domestic VLBI network named GARNET (*G*SI *A*dvanced *R*adio telescope *N*ETwork). We have performed our domestic VLBI observations using GARNET. A series of the observations is named JADE (*J*Apanese *D*ynamic *E*arth observation by VLBI). The main purposes of the JADE series are to define the reference frame of Japan and to monitor the plate motions for the advanced study of crustal deformations. The GARNET stations, centered on TSUKUB32, are located to cover the Japanese mainland. The GARNET stations other than TSUKUB32 have joined some of the international VLBI sessions since 2008.

2. Component Description

The antenna specifications of the Tsukuba 32-m antenna are summarized in Table 1.

Table 1. Tsukuba 32-m antenna specifications

Owner and operating agency	Geographical Survey Institute
Year of construction	1998
Radio telescope system	Az-El
Receiving feed	Cassegrain
Diameter of main reflector	32 m
Azimuth range	10 – 710°
Azimuth velocity	3°/sec
Elevation range	5 – 88°
Elevation velocity	3°/sec
Tsys (X/S)	50 K / 75 K
SEFD (X/S)	320 Jy / 360 Jy
RF range (X1)	7780 – 8280 MHz
RF range (X2)	8180 – 8680 MHz
RF range (X3)	8580 – 8980 MHz
RF range (S with BPF)	2215 – 2369 MHz
Recording terminal	K5/VSSP32

In 2009, no new equipment was installed at the station. Since the Field System PCs installed in 2002 had a problem with their motherboards, repair work was performed using parts of a backup PC. And in case of future trouble with the Field System PC, we set up a new backup PC for the Field System.

Since last year, the Tsukuba e-VLBI network joined SINET3 (The *Science Information NET*work 3). A reduction of the rate of data transfer occasionally occurred, but it was improved by updating ROM in the network switch. Now the network maintains a stable speed of about 600 Mbps. All VLBI data obtained at TSUKUB32, SINTOTU3, CHICHI10, and AIRA is transferred to an overseas correlator via SINET3.

3. Staff

Table 2 lists the regular operating staff of GSI's VLBI observation group.

Kozin Wada (the former Deputy head) moved to another organization. Yoshihiro Fukuzaki succeeded to the Deputy head position. Yuji Miura newly joined the VLBI section as a technical staff member. Kazuhiro Takashima was elected as an IVS Directing Board at-large member. Kensuke Kokado began staying at the Haystack Observatory in the US as a visiting researcher for one year, starting on January 7, 2009. Routine operations were mainly performed under contract with Advanced Engineering Service Co., Ltd. (AES).

Table 2. Staff list of the GSI VLBI group

Name	Position
Shigeru MATSUZAKA	Head of Space Geodesy Division
Yoshihiro FUKUZAKI	Deputy head of Space Geodesy Division
Shinobu KURIHARA	Responsible official
Kensuke KOKADO	Visiting researcher at Haystack
Yuji MIURA	Technical staff
Daisuke TANIMOTO	Technical operator (Observation)
Yasuko MUKAI	Technical operator (Observation and Correlation)
Toshio NAKAJIMA	System engineer (Network)
Kazuhiro TAKASHIMA	Senior researcher, IVS DB at-large member

4. Current Status and Activities

4.1. Geodetic VLBI Observations

The regular sessions in the IVS 2009 Master Schedule are shown in Table 3. TSUKUB32 participated in 58 domestic and international 24-hr VLBI sessions and 151 Intensive 1-hr sessions this year. SINTOTU3, CHICHI10, and AIRA also participated in some international sessions.

Table 3. The number of regular sessions in 2009

Sessions	TSUKUB32	SINTOTU3	CHICHI10	AIRA
IVS-R1	35	–	–	–
IVS-T2	7	–	7	7
APSG	2	2	2	2
VLBA	3	–	–	–
IVS-R&D	3	–	–	–
IYA2009	1	1	1	1
JADE	7	5	7	7
IVS-INT2	102	–	–	–
IVS-INT3	49	–	–	–
Total	209	8	17	17

4.2. Special Astrometric Session IYA2009

In November, TSUKUB32, SINTOTU3, CHICHI10, and AIRA participated in the IYA2009 special session commemorating the International Year of Astronomy 2009. Since a major goal of the session was outreach, GSI issued a press release, and the article appeared in a newspaper. In addition the real-time streaming video of TSUKUB32 was distributed to the world via the Internet, and images were updated every minute and posted from SINTOTU3, CHICHI10, and AIRA.

4.3. Ultra-Rapid DUT1 Experiments

Following last year's results, we continued the Ultra-rapid dUT1 experiments. This experimental effort is a joint project of Japan (GSI & NICT) and Fennoscandia (Onsala & Metsähovi). As a new effort, we tried to transfer the regular IVS 24-hr data from Onsala to the Tsukuba correlator and to carry out automatic data conversion, correlation, and data analysis. The experiment was conducted in four IVS 24-hr sessions: R1385 (June 29), RD0907 (July 8), R1409 (December 14), and RD0910 (December 16). Since the recording rate of these sessions was 256 Mbit/sec, nothing went wrong with the data transfer. A set of 35 observations was analyzed in near real-time and produced a dUT1 estimate. We were able to obtain the dUT1 result within about 20 minutes after the end of the last scan in a set of 35 observations. As a result, the contiguous dUT1 values were obtained every few minutes.

4.4. Developing a Compact VLBI System (MARBLE)

GSI and NICT (National Institute of Information and Communications Technology) are developing a compact VLBI system with a 1.5-m diameter aperture dish (MARBLE: Multiple Antenna Radio-interferometry of Baseline Length Evaluation) in order to provide reference baseline lengths for GPS and EDM calibration. In 2009, the first MARBLE system was installed in Kashima, followed by the second MARBLE system in Tsukuba by NICT. The first geodetic experimental observation was carried out in December between two MARBLEs and two large antennas (TSUKUB32 & KASHIM34). Now the data is being correlated.

5. Future Plans

In March 2010, a new hydrogen maser “Anritsu SA0D05A” and a high-speed digital sampler “ADS3000 plus” will be installed in the Tsukuba 32-m observation room.

6. Other Topics

The English name of the Geographical Survey Institute will change to the Geospatial Information Authority of Japan starting in April 2010. The abbreviated name (GSI) will remain as before. Additionally, the official organization logo was determined (see Figure 2).



Figure 2. Official organization logo of GSI